

### REMARKS

By this Amendment the specification has been amended to include standard topic headings and the claims have been amended to better conform with U.S. practice and to address the examiner's objections. Entry is requested.

In the outstanding Office Action the examiner has rejected claims 1-9 (and apparently claims 30-34) under 35 U.S.C. 102(b) as being anticipated by Thompson et al., and claims 10-29 under 35 U.S.C. 103(a) as being unpatentable over Thompson et al.

The applicants assert that these rejections are without merit.

The present invention involves non-contact acoustic spectroscopy of a chemically sensitized resonator at short and long range. This is achieved by using an impedance measuring circuit that uses a multiply resonant coaxial line resonator (or cavity that contains a standing electromagnetic wave) allied to an antenna coupling (electric field, magnetic field) and radiating element (propagating electromagnetic wave).

The method disclosed by Thompson et al., on the other hand, involves a non-contact measurement of acoustic resonances of a chemically sensitized resonator at short range. This is achieved with an impedance measuring circuit that uses a traditional capacitor (that contains an AC current) wired in parallel with a coupling coil (local electric field or magnetic field).

The examiner states that the present invention, as defined in claim 1, is anticipated by Thompson et al. The applicants strongly disagree with this view and believe it to be based on an incorrect understanding of the device in Thompson et al.

In particular, on page 3, lines 4 and 6 of the Office Action, the examiner relates the "coupling means" of claim 1 with the capacitor shown in Figure 3 of Thompson et al. As will be appreciated by someone of ordinary skill in the art, the capacitor of Figure 3 is a tuning capacitor and is not used for coupling at all. This is clear from the passage which reads "the capacitor is connected across the terminals of the coil in order to tune the circuit to electrical resonance" (see page 12, lines 18 to 19 of Thompson et al.).

In this context the capacitor is a tuning means and works with the spiral coil to form a parallel LC tank circuit. The capacitor can therefore only tune the circuit to a single resonance.

In contrast, the present invention uses a "multiply resonant coaxial transmission between the coil and the detector" (see page 8, lines 29 to 31 and Figure 6). As stated in the description, the coaxial transmission line 6 is used to provide "quick recovery of data over a wide bandwidth" and avoid "time consuming manual tuning of the electrical characteristic" (see page 8, lines 27 to 31).

The description continues by stating that "because of its repeating electrical impedance, the coaxial line 6 transfers RF current over a wide bandwidth without a [sic] deleterious matching losses. For this reason, it effectively replaces the capacitor used with the original MARS system, which acts as a current shunt at high frequency" (see page 8, line 32 to page 9, line 2).

The provision of an EM standing wave provides multiple resonances, as evidenced by the spectra of Figure 4. The examiner has tried to equate the acoustic spectrum provided by the present invention with that of Thompson et al. (page 11, lines 6-9 and page 15, lines 1-8). The spectrum provided by Thompson et al. device, however, requires manual adjustment or substitution with a different capacitor. Thompson et al. simply repeat the circuit tuning aspect mentioned in the prior art.

Accordingly, because Thompson et al. do not disclose the use of coupling means, but rather tuning means, it is considered that the present invention, as defined by claim 1, is clearly novel thereover.

The above novel feature of the present invention provides several advantages over the device disclosed in Thompson et al.

For example, because of the coupling means, the device of the present invention provides greater bandwidth, which brings with it the benefit of providing more information. Moreover, when using the resonant coaxial line or cavity in the present invention, there is no need to manually tune a capacitor. All that needs to be done is to match the

acoustic resonance frequency to overlap the resonance frequencies of the standing wave in the coaxial line.

Similarly, the resonating coaxial line can be attached to the coli and the microwave horn/antenna to dramatically increase the frequency of operation. This allows the method of the present invention to address the challenge of acoustic spectroscopy, and the figures of the present application show this with multiple frequency measurements extending into the microwave frequency zone (1GHz and above).

In contrast, Thompson et al. describe a capacitor which has no length component to form standing waves, whereas the multiply resonant coaxial line has a specific electrical length to contain an electromagnetic standing wave. Without it, the device disclosed in Thomson et al. is limited to data with a single resonance frequency at any one time.

Another advantage of the novel feature of the present invention is that it provides a greater range, as the present invention can sense an object's mechanical changes based on reflectivity of a travelling electromagnetic wave, rather than a small sample placed in the near field wave (i.e., a sample within mms of antenna). The concept of a travelling wave path to the sample via an antenna is implicit in the mention of microwave horn in the present application. This is simply not disclosed in Thompson et al.

A further advantage of the present invention is that more materials can be studied, as impedance measurement works with all materials and structures that have electric or magnetic dipoles. These must support acoustic wave and can be larger scale mechanical structures at distances of several meters. Again, this is simply not envisaged by Thompson et al.


Another advantage provided by the novel feature of the present invention is that of distinguishing molecules through their acoustic spectra. This is not provided by any acoustic sensor technology. The prior art, including Thompson et al., uses chemically derivitized surfaces to chemically 'hook' partner molecules. In contrast the present invention can find changes in the acoustic impedance of molecule as a function of frequency, which is a physical parameter that does not require surface chemical 'hooks'.

An allowance of the presented claims is requested.

Respectfully submitted,

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